Hess's Law Worksheet

What is the ΔH for the reaction below?

$$IF_5\ (g) \rightarrow IF_3\ (g) + F_2\ (g)$$

Use the following data to calculate your answer.

$$IF\ (g) + F_2\ (g) \rightarrow IF_3\ (g) \quad \Delta H = -390\ kJ$$

$$IF\ (g) + 2F_2\ (g) \rightarrow IF_5\ (g) \quad \Delta H = -745\ kJ$$

Given the following reactions:

$$Fe_2O_3\ (s) + 3CO\ (s) \rightarrow 2Fe\ (s) + 3CO_2\ (g) \quad \Delta H = -28.0\ kJ$$

$$3Fe\ (s) + 4CO_2\ (s) \rightarrow 4CO\ (g) + Fe_3O_4\ (s) \quad \Delta H = +12.5\ kJ$$

calculate the enthalpy of the reaction of Fe_2O_3 with CO as shown below.

$$3Fe_2O_3\ (s) + CO\ (g) \rightarrow CO_2\ (g) + 2Fe_3O_4\ (s)$$

Calculate the standard enthalpy of formation of gaseous diborane (B_2H_6) using the following thermochemical information.

$$4B(s) + 3O_2(g) \rightarrow 2B_2O_3(s) \qquad \Delta H = -2509.1\ kJ$$
$$2H_2(g) + O_2(g) \rightarrow 2H_2O(l) \qquad \Delta H = -571.7\ kJ$$
$$B_2H_6(g) + 3O_2(g) \rightarrow B_2O_3(s) + 3H_2O(l) \qquad \Delta H = -2147.5\ kJ$$

Given the data in the table below, calculate the ΔH°_{rxn} for the following reaction.

$$IF_5\ (g) + F_2\ (g) \rightarrow IF_7\ (g)$$

Substance	ΔH_{fe} (kJ/mol)
IF (g)	-95
IF_5 (g)	-840
IF_7 (g)	-941

The following reaction is known as the thermite reaction:

$$2Al_{(s)} + Fe_2O_{3(s)} \rightarrow Al_2O_{3(s)} + 2Fe_{(s)}$$

This highly exothermic reaction is used for welding massive units, such as propeller for large ships. Using enthalpies of formation values, Appendix 4 (pages A19-A22), calculate ΔH^o for this reaction.

Your gas grill at home burns propane gas, $C_3H_{8(g)}$. Using standard enthalpies of formation, Appendix 4 (pages A19-A22), calculate the quantity of heat produced when 1.0 g of propane is completely combusted in air.

Complete combustion of 1 mol of acetone (C_3H_6O) liberates 1790 kJ:

$$C_3H_6O_{(l)} + 4\ O_{2(g)} \rightarrow 3CO_{2(g)} + 3H_2O_{(l)}$$

Using this information together with known heats of formation data, Appendix 4 (pages A19-A22), to calculate the heat of formation of acetone. If 5.0 grams of acetone is combusted, how much energy will be released?

Consider the following unbalanced redox reactions in aqueous solution:

$Ag^+_{(aq)} + Li_{(s)} \rightarrow Ag_{(s)} + Li^+_{(aq)}$ $\quad \Delta H_f^o$ for Li^+= -278.5kJ/mol

$Fe_{(s)} + Na^+_{(aq)} \rightarrow Fe^{2+}_{(aq)} + Na_{(s)}$ $\quad \Delta H_f^o$ for Fe^{2+}=-87.86 kJ/mol

$K_{(s)} + H_2O_{(l)} \rightarrow KOH_{(aq)} + H_{2(g)}$

a) Balance each of the reactions.

b) By using data in Appendix 4 (pages A19-A22), calculate the ΔH^o for each of the reactions.

c) Based on the ΔH^o for the reactions, which do you expect to be unfavorable?

d) Use an activity series to predict which of these reactions should occur. Are these results in accordance your conclusion in part c?